

Sonority-Driven Vowel Epenthesis in L2 Acquisition*

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This paper addresses the vowel epenthesis attested by Korean-speakers of English. I demonstrate that a set of Optimality Theoretic constraints are responsible for the phenomenon. In particular the interaction between faithfulness constraints and sonority-based markedness constraints determines whether the process takes place or not. This explanation is successful to predict surface variations and transitory movement from the earlier to the later stage of language acquisition. The result of this analysis is that vowel epenthesis is motivated to satisfy the universal markedness constraints in favor of onset. This sonority-based explanation clarifies the graded preference to be onset among consonants; obstruents are compelled to occupy onset, to the exclusion of sonorants. The primary strength of this approach surfaces in overcoming the problems arising from principles-and-parameters approach. The idea of all-or-nothing of the approach is ill-suited to entertain the variations and movement of language acquisition from one stage to the next.

1. Introduction

Recently, the confluence of two major streams of linguistic study has made it possible to elucidate the so-called 'interlanguage' under the general linguistic theory. One thing is that we come to the consensus to the view that interlanguage should be included within the boundary of natural

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language, produced by the speaker-internalized linguistic knowledge. The appropriateness of this view is amply advocated by those whose main concerns do not lie in language acquisition proper (e.g. Broselow 1988) as well as practitioners in language acquisition (e.g. Flynn 1988, Eckman 1991). The other thing to lead to the current state of art on L2 acquisition research is that now we are sufficiently equipped with tools to handle the issues arising with L2 acquisition. The ideas and theoretical tools provided by Optimality Theory (Prince and Smolensky 1993) prove to be adequate to deal with the impasse met by previous approaches.

The relation of language acquisition to language itself is like that of head and tail of coins. Since language acquisition corresponds to the reverse side of language itself, any serious linguistic theory cannot miss the interrelationship between them. In fact, OT has, from the scratch, deeply involved the issue of language acquisition. Narrowing down our focus to phonological aspects of language, within the last couple of years, researchers like Demuth and Davidson (1977), Broselow, Chen, and Wang (1998), Hancin-Bhatt and Bhatt (1977), Gnanadesikan (1995), among others, have explicated first and second language acquisition within the framework of OT. This paper is part of those efforts to account for the interlanguage obtained from Korean-speakers of English in terms of constraint interactions.

The organization of this paper is as follows: §2 pursues the teleology of the vowel epenthesis at the beginning and early intermediate level of interlanguage obtained from Korean speakers of English and shows the propensity of sonority-drivenness. We also discuss the implications of our analysis to Lombardi's (1997) generalization on coda. §3 deals with the aspects of variations in the interlanguage and advocates our analysis based on constraint hierarchy. §4 is concerned with types of segmental or prosodic features which trigger or block vowel epenthesis. §5 deals with residual data which challenge the analysis employed in this paper and §6 concludes this study. This paper is supplemented by Appendix, in which I designate the inadequacy of principles-and-parameters approach and the view on Korean moraic structure held by Broselow and Park (1995).

2. Teleology of Vowel Epenthesis

2.1. The Role of Sonority

When Korean learners of English as second language encounter the input

string ending with a closed syllable, the prevailing strategy to appeal to is vowel epenthesis. In this section, I will address the motivation of the vowel epenthesis and grope our way for the rest of this study.

Above all, the most noteworthy on the vowel epenthesis is that the phenomenon does not take place across the board. It is sensitive to the inherent quality of the triggering segments. To provide a proper account for this, it is obvious that we must explore the fundamental origin of the skewed manifestation. Let us scrutinize into data. As arranged in (1), the landmark of vowel epenthesis falls between obstruent and sonorant consonants.

(1)	<u>target</u>	<u>interlanguage</u>	<u>target</u>	<u>interlanguage</u>
a.	bit	bit ^h i (~bit) ¹	sin sin ϕ	*sini
	mid	mid ⁱ	seal seal ϕ	*seali
	bus	busi	mom mom ϕ	*momi

The asymmetry between the two categories is striking: On the one hand, an epenthetic vowel is under duress in the presence of obstruents (1a); On the other hand, the sonorant coda disallows an epenthetic vowel (1b). Abstracting away from the surface variations, it would be a *prima facie* case that Korean-speakers of English respond differently to the two major categories of consonants. Since this sort of vowel epenthesis is never seen in both Korean and English, we can attribute the bipolarity neither to the transfer effect by the speakers' knowledge on native language, nor is it motivated to follow the target language pattern. Likewise, the vowel epenthesis cannot be accounted for by the precept of 'markedness differential hypothesis' (Eckman 1991), which claims that only more marked features of the target language than native language incur problem for the L2 learner. Since obstruents at coda are cost-free in L1, the input string is not more marked than the corresponding L1. Then, what else is the teleology of the vowel epenthesis? My answer is: to serve a function to convert a coda consonant into onset and to result in less marked syllable structure CV.CV. Next question is: Why are, among coda consonants, obstruents likely to be subject to the alternation? My answer is: due to the interplay between sonority-driven onset requirement and faithfulness. The primary aim of this

¹ The issue of surface variations will be discussed in §3. A note on the notational convention in this paper. To highlight our point and prevent distraction of readers, the orthography of the target words will be maintained, except for the crucially concerned segments at hand.

section is to embody those key ideas on vowel epenthesis. We need direct characterization to break asunder the two major categories of sonorants and obstruent consonants. For this reason, I would like to propose that the prohibition of vowel epenthesis after sonorant coda in (1) is determined by the interaction of universal markedness constraints on onset and faithfulness constraints. The introduction of the family of constraints on harmonic onset (2) serves our purpose:²

(2) Harmonic Onset (HONS)

ONS/p,t,k >> ONS/b,d,g >> ONS/s,z >> ONS/m,n >> ONS/r,l >>
ONS/i,u >> ONS/e,o >> ONS/a³

A similar idea on the propensity to be syllable margins is couched by Itô and Mester (1994) (I & M), as (3):

(3) BESTCODA ALIGN ([+son], R, σ , R)

BESTONSET ALIGN ([-son], L, σ , L)

I will not adopt I&M's idea, recognizing that this type of constraint should fully expand as a set of constraints like our model (2). One reason to abandon I&M's proposal is that there is no definite cut-off point to judge best or worst. The landmark of I&M is also arbitrary. For example, what about the idea that the threshold of the best onset is nasal consonants? Even though this type of distribution is unattested cross-linguistically, I&M's hypothesis has no reason to outstrip it. The accidental nature of

²For the postulation of (3), I take a leaf from the graded hierarchy Hmargin of Prince and Smolensky (1993: 143):

Hmargin

*M/a >> *M/e >> *M/i >> *M/l >> *M/n >> *M/f >> *M/p

Yet, our HONS is distinct from Hmargin in two respects. First, HONS is a positive characterization on the propensity to be onset, so that it stark contrasts with the negative characterization. Second, HONS implies the inevitability to divide Hmargin into two subhierarchies. Since it is obvious that the two approaches are incompatible, the proof of adequacy among the two options needs further investigation.

³An anonymous reviewer indicates the urgency to account for the obligatory nature of the epenthesis at /bus/, which terminates by a fricative versus the optionality at /bit/ in which a stop ends the input. As a matter of fact, the distinction is due to another issue, which is afar from our main concern. The obligatoriness of the fricative ending is associated with the issue of legitimate coda consonants in Korean.

I&M's theory can be coped with when we adopt the scale of constraints (2).

Now, let us return to our main concern. Since vowel epenthesis is allowed only after obstruents, it follows that the faithfulness constraint DEP posits below ONS/s,z, but above ONS/m,n.

(4) Constraint Interaction (Korean-speaker interlanguage)

ONS/p,t,k >> ONS/b,d,g >> ONS/s,z >> DEP >> ONS/m,n >>

ONS/r,l >> ONS/i,u >> ONS/e,o >> ONS/a

Now, we are in a position to explicate the selective vowel epenthesis. Note the following tableau (5). For the sake of convenience of explanation, I will suppress the irrelevant constraints to our imminent discussion.

(5)

	/sum/	ONS/b,d,g	DEP	ONS/m,n
a.	☞ sum			*
b.	su.mi		*!	

The interpolation of DEP among the family of markedness constraints HONS enables us to eliminate candidate (5b), for which violation of DEP is fatal. Candidate (5a) wins, despite its violation of the lower ranked ONS/m,n. By the same token, the constraint hierarchy (4) accounts for the vowel epenthesis after the obstruent coda, as demonstrated by tableau (6):

(6)

	/mid/	ONS/b,d,g	DEP	ONS/m,n
a.	mid	*!		
b.	☞ midi		*	

The dominance of the markedness constraint ONS/b,d,g over the faithfulness constraint DEP makes it possible to compel the vowel epenthesis for candidate (6b), unlike the case of tableau (5). This analysis demonstrates that we can account for the asymmetry between sonorants and obstruents with respect to vowel epenthesis without adhering to the moraic count with coda consonants, as Broselow & Park (1995) does.

2.2. Why Not Other Strategies?

One question to be raised at this point is why vowel epenthesis is drawn upon rather than to resort to other strategies to relegate the marked inputs (1a). Aside from vowel epenthesis, we can opt for deletion or neutralization

to do the job. In this section, let us review the plausibility of our analysis.

Lombardi (1997) observes that vowel epenthesis is disallowed in the presence of coda ending with ‘voiced’ obstruents. The interlanguage data above seems to oppose this claim in that as noted by tableau (6), vowel epenthesis is compelled to obstruents, regardless of their laryngeal status. Before we suggest a resolution for this problem, let us review Lombardi’s explanation. The severe asymmetry between features [place] and [voice] at coda calls her attention in particular. The upshot of her observation is as follows:⁴

(7) Asymmetry between [voice] and [place]

- a. Coda restrictions on [place] trigger epenthesis, deletion, or neutralization.
- b. Coda restrictions on [voice] undergo only neutralization.

For the explanation for the unparallel behaviors, Lombardi relies upon constraint (8) on feature [place], whereas no corresponding constraint is assumed to be available to the feature [voice]:

(8) CODACON on [place]
 *_{place}
 |
 C]σ

Under her theory, feature [voice] is privative, while there is no placeless consonant.

The interlanguage (1) seems to refute Lombardi’s idea. Even voiced obstruent /d/ at the input /mid/ triggers vowel epenthesis. Actually, Lombardi herself notes this kind of problem (fn. 1) and mentions, citing Eckman (1981), ‘no such pattern occurs in natural languages ... interlanguage are not necessarily natural language’. On the contrary, we can easily encounter views that interlanguage is part of natural language. For example, plenty of authors

⁴ As a classical example for this generalization, Lombardi cites the following data:

[voice]	CodaCon on [place]		
neutralization (German)	epenthesis (Ponapean) (no glosses)	deletion(Diola)	neutralization(Slave)
rund → runt 'round' lɛz → lɛs 'to loosen'	ak dei → ake.dei ak tantat → aka.tantat	let+ku+jaw → le∅.kujaw 'they won't go' ujuk+ja → uju∅.ja 'if you see'	ts'ad → ts'ah 'hat' seeg → seeh 'saliva'

cited in Smith (1994) argue that interlanguage systems are 'natural' in the theoretical sense erected by generative grammar; that is, they involve grammars that allow them to generate an infinite range of novel sentences and they have the same basic design characteristics of grammars as possessed by children acquiring their L1. Additionally, it is noteworthy that Eckman himself changes his mind into the position that 'interlanguage must be included in the set of natural human languages along with primary languages' (Eckman 1991: 23). Thus, Lombardi's view on coda seems to abort by the interlanguage data. Still it is mysterious why the majority of Korean speakers do not produce the output [mit] from the input /mid/. We cannot attribute the result to the dominance of IDENT(voice), since at the non-intervocalic position, voiced obstruents are rigorously prohibited in interlanguage as well as in L1, as illustrated by tableau (10):

(9) Incorrect Output

/buy/	IDENT(voice)	*voice
a. puy	*!	
b. ɪ buy		*

The prediction of incorrect output (9b) seems to mean that the position of the two constraints ought to be swapped. However, dominance of *voice results in the across the board prohibition of voiced obstruents. This constraint hierarchy fails to predict actual output [midi].


(10) Incorrect Output

/mid/	*voice	IDENT(voice)
ɪ mit		*
midi	*!	

Then, why does the vowel epenthesis take place with input /mid/? My answer is rather modest: Lombardi's view should be radically revised. Namely, for the theory to work, it must be conjoined with the family of constraints HONS (2), to guarantee vowel epenthesis after voiced obstruent coda. Notice that what works to trigger vowel epenthesis is the ranking of the dominance of ONS/obstruent, that is, ONS/p,t,k, ONS/b,d,g over *voice. It means that in the language where the effect of *voice is visible like German or Dutch, ONS/obstruent is dominated by *voice. On the contrary, the overwhelming of *voice by ONS/p,t,k, ONS/b,d,g permits the instantiation


of feature [voice]. The following tableau recapitulates the interaction of the overall constraints:

(11)

/mid/	ONS/p,t,k	ONS/b,d,g	DEP	IDENT(voice)	*voice
a. mid		*!			*
b. mit	*!			*	
c.  midi			*		*

Candidates (11a) and (11b) are doomed by fatally violating constraints on onset and candidate (11c) wins. The bottom-rankedness of *voice makes it invisible for the output determination. Also, the blocking of epenthesis in German is attributable to the dominance of DEP, *voice over HONS, as illustrated by tableau (12).

(12) Devoicing (German)

/rund/	DEP	*voice	ONS/b,d,g	IDENT(voice)
 runt			*	*
rundi	*!	*		
rund		*!		

Still, our analysis is silent about the fundamental issue why vowel epenthesis rarely occurs in the presence of voiced obstruents, as mentioned by Lombardi. If constraint reranking is allowed without restrictions, we would hardly expect the marginality of vowel epenthesis in this environment. For the explication, notice that vowel epenthesis and devoicing violate distinct kinds of constraints. The former violates DEP and *voice, simultaneously, while the violation of the latter confines to IDENT(voice). When we assume the violation of faithfulness constraints DEP and IDENT(voice) cancels each other, as proposed by Tesar and Smolensky (1998), then the violation of *voice by the former is fatal. Moreover, the dominance of markedness constraint *voice over faithfulness constraints is parallel to the idea of Smolensky (1996) on the initial stage of language acquisition: total dominance of the former over the latter.

3. Treatment of Variations

The proper treatment of multiple surface forms realized from a single

underlying form has attracted our attention since pre-OT era. For example, free variations like [ɛ]~[i] in words *entire*, *economic* are far afield of pure linguistic characterization and passed to the matter of variable rules pertaining to sociolinguistics. The same problem is encountered in accounting for the variations in language acquisition. For example, Dickerson (1975: 401) claims 'the learner's second-language system must be a system of variable rules'. One central problem with previous derivational machinery for the treatment of multiple outputs lies in the essential property of all-or-nothing. On the contrary, the occurrence of multiple outputs seems to be well-suited to OT's position that grammar of a particular language is defined as constraint hierarchy, and variations are due to the equal ranking of concerned constraints whether the indeterminacy in ranking is interpreted as probabilistic (Boersma 1997), or of stratified domination hierarchies (Demuth 1997). The upshot of this idea is that the variations are owing to the indeterminacy of hierarchy among relevant constraints and violation of one of constraints at the same strata pays the same penalty. Also Inkelas, Orgun and Zoll (1996), Hahn (1998) mention that not only do different languages and dialects have different rankings of universal constraints, individual lexical items may force reranking as well. Abstracting away from minor details, all of these ideas claim that the variations are characterized as grammar with multiple constraint rankings.⁵ The allowance of the multiple grammars within a grammar can be criticised as too gratuitous and need our further understanding on the matter. Since the problem is too afield of this study, we will simply pursue the line that the variations are due to constraint reranking.

Let us concern the following data.

- (13) bit → bit ~ bit^{hi}
 pot → pot ~ pot^{hi}
 cut → cut ~ cut^{hi}
 pat → pat ~ pat^{hi}
 mat → mat ~ mat^{hi}

⁵ Recently, the issue of variations ignites lively debates by OT practitioners. For instance, Fukazawa (1998) claims that the allowance of coexisting grammar denies the basic tenet of OT that only a single candidate is viable as output. For example, In Japanese lexicon, a monolithic constraint hierarchy coupled with multiple input-output faithfulness constraints is enough to entertain the diversity of lexical strata proposed by Itô and Mester (1995).

For the explication of the vowel epenthesis taking place as inter- or intra-speaker variations by Korean speakers of English, I propose that the variation is accounted for by the coexistence of rankings of concerned constraints, as postulated in (14):

(14) Variations by Double Constraint Ranking

a. epenthesis: HONS >> DEP

	ONS/p,t,k	DEP
bit	*!	
bit ^h i		*

b. no epenthesis: DEP >> HONS

	DEP	ONS/p,t,k
bit		*
bit ^h i	*!	

One thing to bear in mind for the data is that at the early stage of interlanguage, speakers unanimously insert vowel, but as they enhance their nativity towards target language, they tend to show the faithfulness to the target. It means the ranking swap between ONS/t and DEP is compelled. This phenomenon is intuitively plausible considering that the goal of language acquisition is mastering the target forms, in which the vowel epenthesis is not invoked.

In the next section, we will concern relevant factors to vowel epenthesis in the Korean interlanguage, aside from the sonority factor discussed in §2.

4. Other Relevant Factors to Vowel Epenthesis

4.1. Place

In §2, we have discussed the coordination among the sonority-driven harmonic onset constraints and faithfulness constraint DEP to determine triggering and blocking vowel epenthesis. In tandem with this, we have additional factors to control the vowel epenthesis. As illustrated by (15), the harmonic onset constraints as postulated as (2) cannot afford to rule out the vowel epenthesis.

- (15) *cap* → **cap^hi*
map → **map^hi*
sap → **sap^hi*
kick → **kick^hi*
tip → **tip^hi*

The disallowance of epenthesized forms in (15) seems to foreshadow additional constraints. Comparing the input forms above with those of (1) or (13) gives us a clue to the resolution. Notice that in (15) codas are composed of non-coronal obstruents, in contrast with the case of (13), in which coronal obstruents close syllables. Recognizing the prevalence of non-coronal coda and scarcity of coronal coda, we can postulate constraint (16), adapting McCarthy and Prince (1994):⁶

- (16) CODA/[–cor]

Non-coronal consonant must be in coda.

To permit vowel epenthesis in (13), to the exclusion of the case (15), constraint (16) must outrank the whole gamut of HONS and DEP. Notice that in §2.1, we discussed the dominance of the HONS on obstruents over the latter. I assume that MAX is undominated.

- (17) Preference for Non-coronal Coda

CODA/[–cor] >> ONS/p,t,k >> DEP

The constraint interaction (17) demonstrates that the role of that constraint ranking is crucial only when non-coronal consonants end syllable.

(18)

/cap/	CODA/[–cor]	ONS/p,t,k	DEP
a. cap		*	
b. cap ^h i	*!		*

⁶ The validity of the adaption of the original formulation McCarthy and Prince to our positive notion should be further investigated:

No Coda(cor)

No coronal consonant in coda

As an anonymous reviewer points out, constraint (16) is dominated by another constraint like IDENT(____)_{1st-σ}, which serves to keep non-coronal intact at the word-initial position like in word /pat/.

The candidate (18a) wins, unlike the following (19a), since CODA/[-cor] outranks ONS/p,t,k.

(19)

/bit/	CODA/[-cor]	ONS/p,t,k	DEP
a. bit		*!	
b. bit ^h i			*

With the reverse ranking (20), vowel epenthesis is categorically prohibited as seen by tableaux (21) and (22).

(20) DEP, CODA(-cor) >>ONS/p,k

(21)

	DEP	CODA/[-cor]	ONS/p,t,k
cap			*
cap ^h i	*!	*	

(22)

	DEP	CODA/[-cor]	ONS/p,t,k
bit			*
bit ^h i	*!		

The tableaux above indicate that with Korean learners of English, the interlanguage at earlier stage has the constraint ranking (17), while as they master the target language, they gradually move on to the stage with grammar involving (20). Under our theory, non-coronal coda has no chance to instantiate vowel epenthesis.

Let us turn to another vowel epenthesis produced by Korean speakers. As illustrated below, the vowel epenthesis is sensitive to places of articulation of the consonant sequences. Among the consonant plus glide clusters, coronal consonant followed by /w/ triggers vowel epenthesis, as shown in (23b):

(23) native & Sino-Korean interlanguage

a. velar + /w/: *no vowel epenthesis*

kwi 'ear' queen [k^hwin] *[k^hi.win]
quiz [k^hwiz] *[k^hi.wiz]

b. coronal + /w/: *vowel epenthesis*

twi 'back' twin [t^hi.win]
swi 'be quiet' sweet [si.wi.t^hi]

c. consonant + /y/: *no vowel epenthesis*

kyusu 'damsel' fuse [fyu.zi] *[fi.yu.zi]

tutor [t^hyu.t^hər] *[t^hi.yu.t^hər]

For the explication of the asymmetry between coronal vs. noncoronal obstruents and /w/ and /y/, the reliance to 'gestural overlap' (Browman and Goldstein 1987) is called upon. According to the idea, the asymmetry is a prevalent phenomenon. The point relevant to our purposes is that the gestural hiding at coronal-noncoronal sequences is inevitable due to the articulatory fact that tongue tip velocities are faster than other articulators. The passing movement of coronal gestures stands for the readiness of articulatory hiding by the articulation of the following segment. The cluster coronal-/w/, to the exclusion of coronal-/y/, is the case. Now it is clear why the sequence coronal-/w/ fails to realize at the surface. We can reinterpret the phonetic property into constraint (24):

(24) *[+cor][-cor]

The sequential markedness constraint (24) interacts with faithfulness constraints to induce vowel epenthesis, as demonstrated by (25):

(25) a.

/sw/	MAX	*[+cor][-cor]	DEP
<S>w	*!		
sw		*!	
☞ siw			*

The dominance of MAX and *[+cor][-cor] over DEP makes it possible to separate the two consonants by vowel epenthesis. The constraint *[+cor][-cor] is irrelevant to the sequences like *kw*, *ky*, *ty*, *fy* etc., and thus vowel epenthesis is not compelled, as shown by the following tableau:

b.

/kw/	MAX	*[+cor][-cor]	DEP
☞ k ^h w			
k ^h iw			*!
<k>w	*!		

The L2 vowel epenthesis clearly contrasts with native or Sino-Korean, as exemplified by (23):

- (26) a. Native & Sino-Korean: MAX, DEP >> *₁[+cor][-cor]
 b. L2 acquisition: MAX, *₁[+cor][-cor] >> DEP


The dominance of faithfulness constraints in native and Sino-Korean leads to prohibition of vowel epenthesis.

4.2. Manner

In Korean features [laryngeal] and [continuant] drop to neutralize to plain stop at the syllable coda. But the interlanguage produced by Korean-speakers does not conform to this explication. For example, the input /bus/ is predicted to be [but]. Yet, the interlanguage emerges as [busi]. It implies the transfer of the expertise of Korean to interlanguage is blocked. The difference between L1 and L2 acquisitions is that even though L1 acquisition can be explained by ‘demotion’ of markedness constraints below faithfulness constraint (Tesar and Smolensky 1998) or promotion of faithfulness constraints over markedness constraints (Gnanadesikan 1995), L2 acquisition is not so simple. Since the target language is also likely to exert influence on the interlanguage, let us give a glance at English. We have no CODACON on the feature [cont], or [voice] in English. Then, we expect L2 has no influence in this case and L1 grammar alone transfers to the interlanguage. However, it is not the case. This means that in the case of interlanguage, the lack of influence of the target language phonology does not guarantee that its form necessarily conforms to L1. Instead, the effect of universal markedness constraints (e.g. (2)) comes into play. For the interlanguage, the fidelity to the target form IDENT(+cont) outranks markedness constraint *₁[+cont] and makes the latter invisible, as shown by (27):

- (27) Hierarchy for Interlanguage:

ONS/p,t,k >> ONS/s,z >> DEP, IDENT(+cont) >> *₁+cont

	ONS/p,t,k	ONS/s,z	DEP	IDENT(+cont)	* ₁ +cont
a. bus		*!			*
b.  busi			*		*
c. but	*!			*	
d. but ^h _i			*	*!	

The violation of IDENT(+cont) with candidate (27d) dooms its fate and

candidate (27b) wins. However, in the examples of interlanguage (28), the markedness constraints $*f$, $*v$ on segment inventory overarches other constraints to prevent labial fricatives from manifestation.

- (28) self → $selp^h i$
 life → $lip^h i$
 value → $valbi$

In this section, we have shown that the vowel epenthesis attested in the interlanguage emerging during learning English is originated from the combined effect of various markedness and faithfulness constraints. To sum up, the following hierarchy at the early stage of the interlanguage is established among the constraints so far addressed.

- (29) Hierarchy at Beginning Stage
- ```

 CODA/[$-\text{cor}$]
 |
 ONS/ p, t, k
 |
 ONS/ b, d, g
 |
 MAX, $*[+\text{cor}][-\text{cor}]$ ONS/ s, z $*f$, $*v$
 | | |
 DEP, IDENT(voice), IDENT(cont)
 | | |
 ONS/ m, n $*\text{voice}$, $*+\text{cont}$
 |
 ONS/ r, l

```

#### 4.3. Weight

So far, we have shown that vowel epenthesis at the interlanguage of Korean-speakers is controlled by the interactions between the sonority-driven markedness constraints and faithfulness constraints. Notice that the key idea in the exposition is the preference of obstruents for positing at onset. Still, one major problem awaits to be resolved. Consider the asymmetry concerning vowel epenthesis between following two sets of interlanguage. Abstracting away from variations, which was discussed at § 3, I hypothesize an ideal speaker who arrived at the level in which he is able to distinguish the vowel length of the input and produce distinct outputs, given the input pairs like (30).

- (30) a. long vowel  
beat → bit<sup>h</sup>i  
meat → mit<sup>h</sup>i  
seek → sik<sup>h</sup>i  
seep → sip<sup>h</sup>i
- b. short vowel  
bit → bit  
mitt → mit  
sick → sik  
sip → sip


The first problem to be resolved is that even though vowel length is phonemically distinct in Korean phonology, as will be discussed in Appendix, vowel length of the input is not respected by Korean-speakers. The other point is that the input involving long vowels categorically demands vowel epenthesis (30a), in clear contrast with the input with short vowels (30b). The blocking of vowel epenthesis at (30b) means that at the stage at hand during the L2 learning process, the hypothetical learner mastered the constraints hierarchy (31), as already discussed in § 3.

(31) Blocking of Vowel Epenthesis

DEP >> ONS/p,t,k

However, the constraint hierarchy (31) wrongly predicts the blocking of vowel epenthesis to the input with long vowel as well, as demonstrated by tableau (32).

(32) Incorrect Output

| /beat/                                                                                      | DEP | ONS/t |
|---------------------------------------------------------------------------------------------|-----|-------|
| a.  beat |     | *     |
| b. beat <sup>h</sup> i                                                                      | *!  |       |

The current constraint ranking cannot afford to compel the actual output (32b). It follows that additional constraints outrank the given constraints in (32) and control the vowel epenthesis. Then, it is mandatory to look for the constraint. The culprits here are long vowels. It is well-known that cross-linguistically speaking, some languages like Spanish lack long vowels, but no language has vowel system totally composed of long vowels. The markedness of long vowels has been penalized by constraint (33).

(33) No Long Vowel (\*LONGV) (adopted from Rosenthal 1994)

Long vowels are dispreferred.

As we will see in Appendix, the prohibition of long vowels by a constraint



is the crucial difference of our analysis from Broselow and Park (1995), who attribute the absence of long vowel at the interlanguage to the turning off of the parameter on vowel length transferred from L1. Still, it does not suffice to say \*LONGV itself triggers vowel epenthesis. If long vowels are marked and they are prohibited by \*LONGV, output with short vowels, but without vowel epenthesis is predicted to be an optimal candidate. Once again, we must search additional constraints to compel vowel epenthesis confined to this special environment. Perusing the special environment provides the clue. The optimal output makes up for the loss of the vowel length from the input by vowel epenthesis. The idea is translated into constraint (34):

(34) MAX- $\mu$

Moras linked to the input string must have correspondents to those linked to the output string.

Constraint (34) serves the function to carry away the syllable weight of the input to the output. It follows that a language in which compensatory lengthening takes place posits MAX- $\mu$  at the high rank, whereas a language which lacks the phenomenon bottom-ranks this constraint. Thus, constraint (35) accounts for the syllable weight preservation. However, if we employ this constraint only for the purpose of preserving vowel length, we are not afford to prevent endless occurrence of drop-and-add of moras, since despite of the fluctuations, the sum of the moras is preserved. For this purpose, it is necessary to add the following:


(35) STAY- $\mu$

Let the mora  $\mu_i$  be associated with the segment  $S_i$  in the input and let  $\mu_o$  be associated with the segment  $S_o$  in the output. If  $\mu_i \text{ R } \mu_o$ , then  $S_i \text{ R } S_o$ .

By this constraint, we can penalize candidates which bears a floating feature or anchors to the place which does not correspond to the input.

Now, we are well prepared to deal with the vowel epenthesis at the input with long vowels. The prohibition of long vowels and compensating the lost mora by vowel epenthesis is characterized by dominance of \*LONGV and MAX- $\mu$  and bottom-rankedness of STAY- $\mu$ , as illustrated by (36):


(36) \*LONGV, MAX- $\mu$  >> DEP, CODA[-cor] >> ONS/t, STAY- $\mu$

| /seek/                                                                                                  | *LONGV | MAX- $\mu$ | DEP | CODA[-cor] | ONS/p,t,k | STAY- $\mu$ |
|---------------------------------------------------------------------------------------------------------|--------|------------|-----|------------|-----------|-------------|
| a. sik                                                                                                  |        | *!         |     |            | *         |             |
| b. si:k                                                                                                 | *!     |            |     |            | *         |             |
| c.  sik <sup>h</sup> i |        |            | *   | *          |           | *           |

Candidates (36a, b) are ruled out by the fatal violation of dominating constraints. Candidate (36c) satisfies MAX- $\mu$  by transferring one of the moras at input to the epenthesis vowel, even though it violates the low ranked DEP and STAY- $\mu$ , so that it is chosen as output. In our analysis, the motivation of the vowel shortening is to satisfy the high ranked constraint \*LONGV, rather than due to the lack of long vowel in native language. This point sharply contrasts our analysis with Broselow and Park's approach, in which the processes are claimed to be controlled by the grammar of L1.

Lastly, let us examine the vowel epenthesis taking place at the words like *mug*, *keg*, *mid*, *pad* etc., which consistently occur until later stage of the interlanguage. In §2.2, we have already discussed the vowel epenthesis observed at the early stage of the interlanguage. And we have shown that the vowel epenthesis is compelled by the hierarchy in which ONS/b,d,g outranks DEP. Also, we have claimed that the prohibition of vowel epenthesis at the input with short vowels is due to the swapping of ONS/p,t,k and DEP regarding their ranking. Then, by the principle of transitivity, DEP automatically dominates ONS/b,d,g, since ONS/p,t,k outranks ONS/b,d,g in the universal grammar, as shown by (2). However, this constraint ranking (37) proves inadequate to account for the vowel epenthesis at hand:

(37) DEP >> ONS/p,t,k >> ONS/b,d,g

| /mid/                                                                                      | DEP | ONS/p,t,k | ONS/b,d,g |
|--------------------------------------------------------------------------------------------|-----|-----------|-----------|
| a.  mid |     |           | *         |
| b. midi                                                                                    | *!  |           |           |

The actual output (37b) fatally violates the top ranked DEP, so that it is eliminated. To cope with this situation, we need a constraint which compels vowel epenthesis only after voiced obstruent. The differentiation between voiced and voiceless segments requires a constraint based on segmental properties.

Kirchner (1998) proposes an effort-based approach to lenition and fortition.

According to him, lenition and fortition are product of the interaction between articulatory constraints to reduce effort and constraints to preserve underlying specification. He dubs the constraint to minimize the articulatory effort as LAZY.

(38) LAZY

Minimize articulatory effort.

According to Kirchner, constraint LAZY functions to compel a diverse sort of phonological processes under appropriate situation. For example, voicing of intervocalic obstruents, debuccalization at coda, degemination at unstressed syllable, devoicing at coda, aspiration at onset etc. When the antagonistic faithfulness constraints militating against LAZY are dominated, the phonological processes take place. In the wake of the same line, syllable or word final voiced obstruents are penalized by this constraint requiring the saving of effort. The articulatory economics by voicing of intervocalic consonants has been phonetically confirmed.<sup>7</sup> Note the following tableau:

(39)

| /mid/                 | LAZY | IDENT(voice) | DEP | *voice | ONS/p,t,k | ONS/b,d,g |
|-----------------------|------|--------------|-----|--------|-----------|-----------|
| a. mid                | *!   |              |     | *      |           | *         |
| b. mit                |      | *!           |     |        | *         |           |
| c. <sup>ɛp</sup> midi |      |              | *   | *      |           |           |
| d. mit <sup>h</sup> i | *!   | *            | *   |        |           |           |

By the definition of LAZY (38), candidates (39a) and (39d) are ruled out by violating the top ranked constraint. Also candidate (39b) is eliminated by violating feature faithfulness between input and output. Candidate (39c) is predicted to be optimal by satisfying both top-ranked constraints LAZY and IDENT(voice). On the other hand, when the input has a voiceless plosive, as in tableau (44), vowel epenthesis results in fatal violation of LAZY to the output.

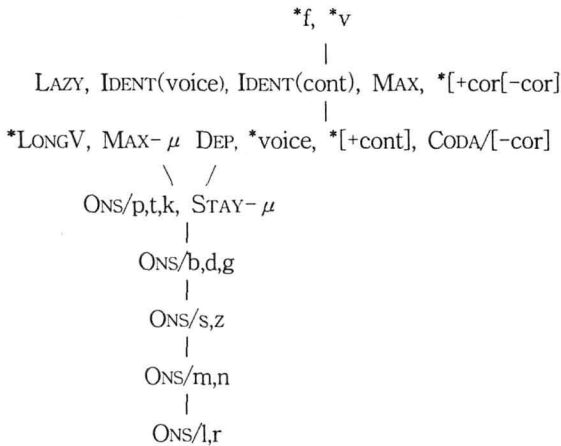
<sup>7</sup> Actually, we cannot determine the place of \*voice among the constraint ranking, except that it is not top ranked. In this case, I posit it immediately lower than top rank, assuming that Smolensky's (1996) idea that at the initial stage of language acquisition, all the markedness constraints outrank faithfulness constraints, and only when learners found negative evidence to contradict the current hierarchy, he demotes the concerned markedness constraint minimally.

(40)

| /bit/                         | LAZY | IDENT(voice) | DEP | *voice | ONS/p,t,k | ONS/b,d,g |
|-------------------------------|------|--------------|-----|--------|-----------|-----------|
| <sup>h</sup> bit              |      |              |     |        | *         |           |
| bit <sup>h</sup> <sub>i</sub> | *!   |              | *   |        |           |           |

To sum up, at the intermediate stage of interlanguage by Korean learners of English, the overall constraint hierarchy transits to (41) from the hierarchy (29) at beginning stage:

(41) Hierarchy at Intermediate Stage



## 5. Residual Data

In §4.3, we have observed that at the intermediate or at advanced level, Korean speakers persistently keep vowel epenthesis at the words ending voiced plosives, but they quit it in the case of voiceless plosives. Also, we have showed that the phenomenon results from interaction of a set of constraints (41). Still, we have data that seem to counterexemplify the analysis, in the sense that the voiced plosive at coda devices, rather than takes the option of vowel epenthesis, as shown by (42):

- (42) club → clup \*club<sub>i</sub>  
 bag → bak \*bag<sub>i</sub>  
 rugby → lukby \*lug<sub>i</sub>by  
 good → goot \*good<sub>i</sub>

Korean speakers come up with the italicized segments which undergo devoicing, instead of vowel epenthesis. We have to account for the discrepancy between these data and those dealt with in §4.3. Before analyzing them, we have one point to bear in mind in explicating L2 acquisition. It is necessary to rule out vigorously the so-called "mimicked form." It means that some interlanguage is results of blind imitation of target language, that is, some L2 forms are not processed by their knowledge about the target language. Namely, performance overstrides competence. It is prohibited to make use of this type of data for building linguistic argument. For example, the following type of inconsistency in phonological knowledge is readily observed from Korean-speakers of English at least at the beginning level.

- (43) a. I don't know    [donØ no]  
       b. waste time     [weist taim]  
           textbook      [teksʈbuk]

How can Korean people come up with the discrepancy in /t/-drop (43a) and (43b), which takes place rigidly at the target language? Native speakers of English show consistency in their /t/-drop phenomena. What makes a difference here is that the frequent used phrase like (43a) more often than not fail to reflect linguistic knowledge of the speaker. Because its frequency is outstandingly high, it can be easily memorized as frequent words often show suppletion, i.e., lexicalized forms rather than morphologically predicted forms: *go/went* vs *plod/plodded*; *bad/worse* vs *malignant/more malignant*. The same phenomenon is observed in L1 acquisition. For example, Gnanadesikan (1995: 8 fn. 3) observes: 'Occasionally, mimicked words show more adult-like pronunciation. This is presumably because G (*sic*) is phonetically capable of producing onsets that her phonology does not allow'.

Now, we are in a position to explicate the data (42). They are petrified forms as loanwords. Since they are stored in their lexicon as adapted to Korean phonology, Korean learners cannot afford to get rid of the preempting forms until they achieve the far advanced level of fluency for the target language. That is, loanword and L2 production are not differentiated at the fossilized forms. (cf. Shinohara 1997)

## 6. Conclusion

In this analysis of interlanguage of Korean speakers for English, the vowel epenthesis has been argued to be resulted from the intricate interplay of universal markedness constraints on requirement on consonants to be onset rather than coda, and faithfulness constraints. The reanalysis under OT terms represents departure from the previous contrastive analysis hypothesis (Lado 1957) as well as markedness differential hypothesis on second language acquisition. The result of this analysis is: vowel epenthesis is motivated to satisfy the universal markedness constraints in favor of onset. This sonority-based explanation is successful to clarify the graded preference to be onset among consonants. Obstruents are compelled to occupy onset, to the exclusion of sonorants. This phenomenon must be *prima facie* case of the emergence of the unmarked. The decisive drawbacks of previous pre-OT analyses on L2 acquisition of phonology derive from their inherent disregard for universal markedness conditions. They have paid attention only to L1 and L2 forms. Also our view on L2 phonology clearly contrasts with Broselow and Park's principles-and-parameters approach. The idea of turn on and off of linguistic parameters is ill-suited to entertain the simultaneous existence of some variable forms met in interlanguage. The undeniable strength of OT analysis for the interlanguage data is that it is successful to accomodate the degenerateness and immense imperfectness of the input in L2 acquisition. Imagine the L2 learning situation in which the learners' input for the target language is amazingly flexible according to the interlocutor's linguistic backgrounds like social, geographical, register variations. In this intricate situation of language acquisition, we cannot expect the homogeneous results of language learning. The OT approach is promising to handle the inter- and intra-speaker variations attested in interlanguage.

## Appendix

### 1. Against Principles-and-Parameters Approach

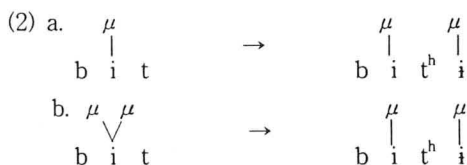
Broselow & Park (1995) (henceforth B & P) claim that Korean L2 learner's vowel epenthesis is motivated to satisfy *the universal principle* of mora conservation:

## (1) Moraic Conservation (originated by Hayes 1989: 152)

Mora count tends to be preserved.

Here, we can raise plenty of questions. Although B&P propose moraic conservation as a principle rather than as a parameter under the principles-and-parameters model, their definition belies their intent. By the definition of linguistic principle 'a property of language common to all languages, a linguistic *tendency* cannot be identified with principles in a traditional sense. Only parameters specify a number of ways languages differ each other. (Probably B&P attribute (1) to the principle rather than to parameter component due to Hayes's term 'conservation *law*.) Then, it seems to have no reason to propose that (1) is a principle. However, the more serious problem is involved with the concept of parameter. The strongest sense of the concept 'parameter' in linguistics is as follows: In the Type A languages, grammar includes the constraint X, and in the Type B languages, it does not. But it is amply proved in current research that this conception is empirically inadequate. The inadequacy stems from its fundamental implication of the notion 'parameter' that the constraint X is always at play and in the Type B languages it never at play. The emergence of the unmarked structure which is enforced by exertion of the inert constraint X in other circumstance clearly supports the OT conception of constraint ranking rather than parameterization, as shown by McCarthy and Prince (1995) and Broselow, Chen and Wang (1998). As we noted, vowel epenthesis of Korean L2 learners is extremely flexible according to the developmental stages. This fact is clearly noticed by BP: 'what beginning Korean-speaking learners of English do not do is distinguish forms like /bit/ and /beat/; vowel insertion applies with the same frequency to both sorts of forms'(p. 116). According to their contention, a linguistic principle is permitted to vary given a proper circumstances. However, this sort of interpretation of linguistic principle does not differ from the precept of linguistic parameter. They are silent about the question why moraic conservation concerns only the intermediate stage of L2 learning, but not the beginning level.

The more problematic is that moraic conservation is overly permissive in that B&P extend the notion as 'prevents mora loss but not mora addition' (p. 167). Under this conception regarding mora conservation, both of the surface form in (2) do not contravene the principle:



It is noteworthy that not only (b) observe moraic conservation, but also (a) does under the extended notion of B&P's conceptualization. Under their theory, it would be impossible to distinguish between the inputs with long and short vowels.

The mono-moraic interpretation of English diphthongs by Korean L2 speakers gives rise to additional problem. This claim fails to entertain the strategies Korean speakers adopt when they encounter English diphthongs. Notice that English and Korean present a contrast in terms of diphthongs; English prohibits on-glide, while Korean disallows off-glides. The outstanding strategy relied upon by Korean speakers is the decomposition of the English diphthongs into two independent vowels, in addition to vowel epenthesis, as illustrated by (3). Here, we see vowel epenthesis is insensitive to the total amount of mora at the surface. It implies that the appearance of epithetic vowels in *pipe* has nothing to do with mora conservation.



As pointed out above, a principles-and-parameters approach towards L2 acquisition involves inherent problems. The problems lie in the misguidedness of the notion 'parameter'. Above all, we must bear in mind that language acquisition is a continuous process and innumerable variations occur. In this respect, the electric nature of on and off of parameters is incompatible with the realities. To conclude, as Demuth (1997) contends, small parameters, or constraints conceived in OT are necessary to take a step on the variegated ground of L2 acquisition.

## 2. Korean Moraic Structure

One of the primary premises on Korean-speakers' interlanguage employed by B&P is that Korean totally lacks phonemic vowel length. In this section,



let us review the moraic structure of Korean. One of oft-mentioned eccentricity pertaining to Korean vowel length is that the length distinction in vowel confines to the word-initial syllable. Notice the length distinction at the initial syllable in (4a) and (4b), from (4c), in which the concerned syllables posit at non-initial syllables.

- |      |                 |                    |                                  |
|------|-----------------|--------------------|----------------------------------|
| (4)  | a. <u>short</u> | b. <u>long</u>     | c. <u>short</u>                  |
| i.   | tʃa:gi 'he'     | tʃa:gi 'magnetism' | tʃən.dʒa:gi 'electric magnetism' |
| ii.  | mal 'horse'     | ma:l 'language'    | han.guŋ.mal 'Korean'             |
| iii. | tok 'poison'    | to:k 'jar'         | tʃaŋ.tok 'soy sauce jar'         |

As shown by (4a, b), vowel length is distinct, regardless of syllable structure at the word-initial syllable; open syllable (i), syllable closed by a sonorant (ii), syllable closed by an obstruent (iii). To all intents and purposes, this set of data constitutes minimal pairs and the realization of long vowels at the word initial syllable is not unusual. It has been generally taken for granted that the word-initial syllable is one of the salient positions in an acoustic or perceptual sense and diverse phonological features realize only at the salient positions, as discussed by Beckman (1998). Here, given the following ranking between faithfulness and markedness, the realization of Korean vowel length at the word-initial syllable can be handled.

- (5) MAX- $\mu$  (1st  $\sigma$ ) >> \*LONGV >> MAX- $\mu$

In terms of this standpoint, it is clear Korean has distinct vowel length. Nevertheless, some practitioners in Korean phonology argue that Korean lacks vowel length. I will show the empirical and logical problems with the claim.

First, B&P, following Moon (1981), contends that Korean lacks vowel length distinction. However, this contention does not go through with Korean phonological fact. The argument for the position that Korean people's perceptual difficulties for vowel length as L2 acquisition or loan words by B&P and Moon is not a real argument. For example, Moon (p. 397, fn. 18) mentions Korean people's inability to distinguish the vowel length of Japanese loanword. However, it is not clear whether perceptual cues for a certain linguistic quality is germane to linguistic matter. Furthermore, a certain phonetic quality is not phonologized in the same way across languages. For example, open syllable lengthening is a trivial phonetic matter in some languages, whereas it phonologizes in other

languages. In OT terms, the former is due to the dominance of \*LONGV over lengthening, while in the latter, lengthening in open syllable outranks the markedness constraint \*LONGV. In other words, the constraint ranking enables us to understand the relative visibility of a certain phonetic cues. Furthermore, B&P's contention against Korean vowel length turns out to be contradictory in terms of current views on moraic theory. First, B&P's argument heavily relies on the assumption that Korean sonorants are moraic, whereas obstruents are non-moraic. In accordance with the typology of language with respect to syllabicity and moraicity by Zec (1988), B&P propose Korean belongs to Type III.

(6) *Typology of Moraic Consonant* (Zec 1988)

|                                                        |                   |
|--------------------------------------------------------|-------------------|
| Type I : Syllabic $\subset$ Moraic = Segment           | English           |
| Type II : Syllabic = Moraic $\subset$ Segment          | Khalkha Mongolian |
| Type III : Syllabic $\subset$ Moraic $\subset$ Segment | Korean (???)      |
| Type IV : Syllabic = Moraic = Segment                  | Berber            |

The important premise of the typology is that the more sonorous a segment is, the more it is likely to be moraic. The language belonging to Type III shows that the set of segments posited at nucleus are a subset of moraic segments, which in turn constitute a subset of whole segments of a language. It means that if a language has a heavy CVC syllables, it will also have heavy CVV syllables. If consonants are in the set of moraic segments, vowels have to, as well. Nevertheless, B&P argue that Korean lacks the distinction in vowel length, even though Korean sonorant is moraic, unlike obstruent. It is contradictory. If sonorants are to be moraic, the presence of long vowel is prerequisite.

Compensatory lengthening is another obstacle to B&P. According to de Chene, B. & S. Anderson (1979), compensatory lengthening is possible only in languages with phonemic vowel length. However, the evidence for Korean compensatory lengthening, as illustrated in (7) is provided by not a few authors, Sohn (1987), E. Han (1990) among others.<sup>8</sup>

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<sup>8</sup>In OT terms, it is not appropriate to employ the pre-OT term compensatory lengthening. As Rosenthal (1994) points out, seeing that the derivational property of dropping and adding of particular segments is not allowed in OT, we should translate the phenomenon into a set of constraints. Onset and MAX- $\upsilon$  are likely to be relevant to the Glide Formation and Vowel Lengthening.

|          |   |          |           |
|----------|---|----------|-----------|
| (7) po-a | → | pwa :    | 'to see'  |
| pi-ə     | → | pyə :    | 'to cut'  |
| ʃu-əsə   | → | ʃwə :.sə | 'to give' |

Moreover, acoustically speaking, vowel distinction between *bit* and *beat* in English is ambivalent; tense/lax and long/short. Which one is dominant and which one is recessive is still controversial. However, when we count syllable weight in English, we attribute the distinction to vowel length, particularly when we assign word stress. For these reasons, I conclude that vowel length is still distinctive in Korean.

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